

ARB's Regulations to Ensure Low Emissions from HDDEs

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Are HDDEs Cleaner?

- **Progressively more stringent certification emission standards**
- **Uncertainty with in-use emissions**
 - **Limited in-use test data**
 - **Certified with an engine dynamometer**
 - **Required engine dynamometer compliance testing**
 - **Costly**
 - **Time-consuming**
 - **Little relevance to real-world emissions**



1990s Off-Cycle NOx

- **7 manufacturers alleged to have turned off emission control devices on HDDVs during highway driving**
- **Resulted in large increases of in-use NOx emissions from HDDVs**
- **Settlement Agreements signed 1998**
 - **Elimination of off-cycle emissions through additional certification tests: ESC, NTE**
 - **Pull ahead of 2004 standards to Oct. 2002**
 - **Other requirements**

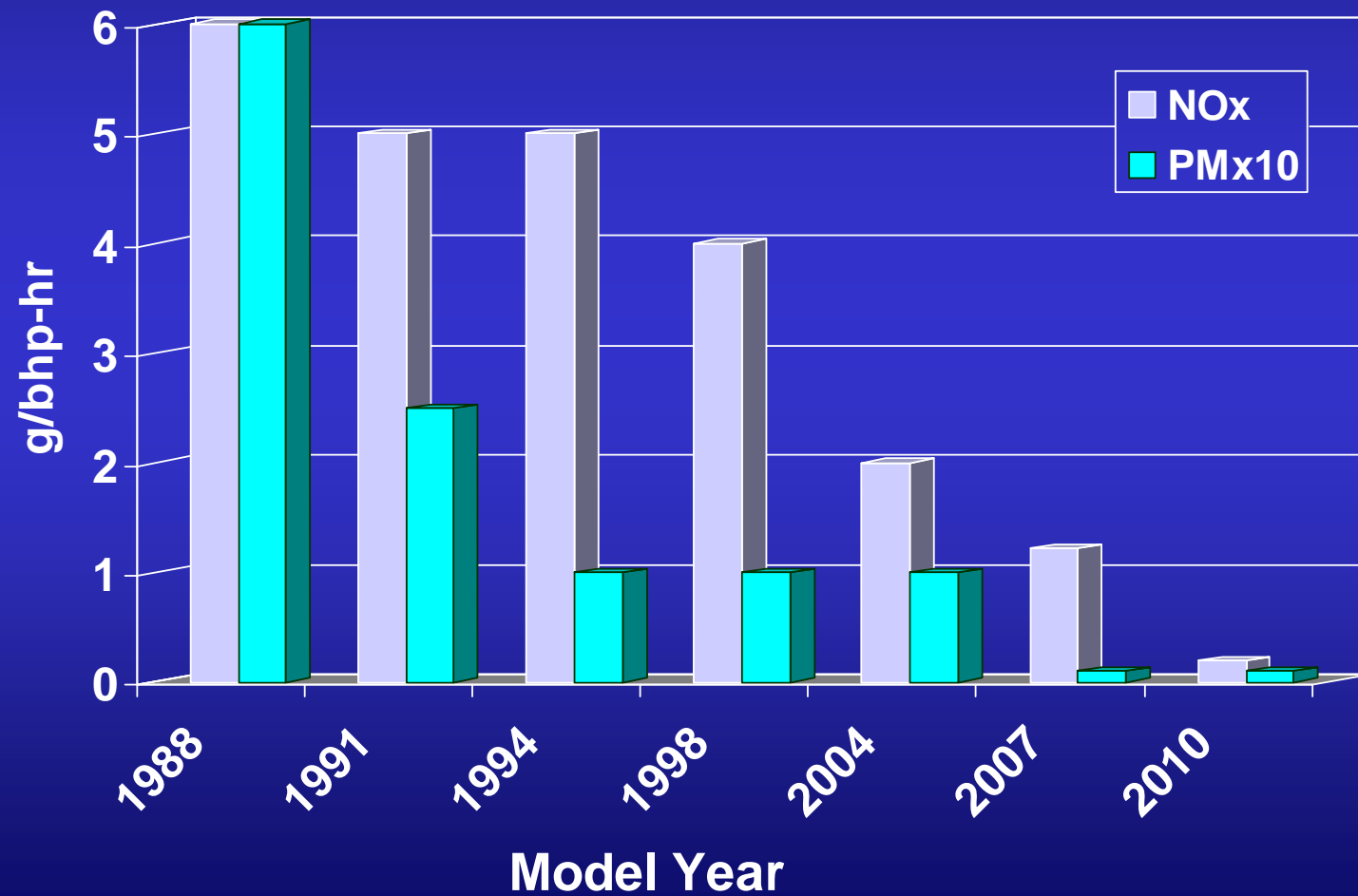


Multi-Facet Approach to Reducing HDDE Emissions

CERTIFICATION	EFFECTIVE DATE
Emission Standards	Continuous
NTE Compliance	2005 MY
IN-USE	EFFECTIVE DATE
In-Use Compliance Testing	Dec. 2007 (gas) Oct. 2008 (PM)
OBD Compliance	2007 MY (EMD) 2010 MY (OBD)

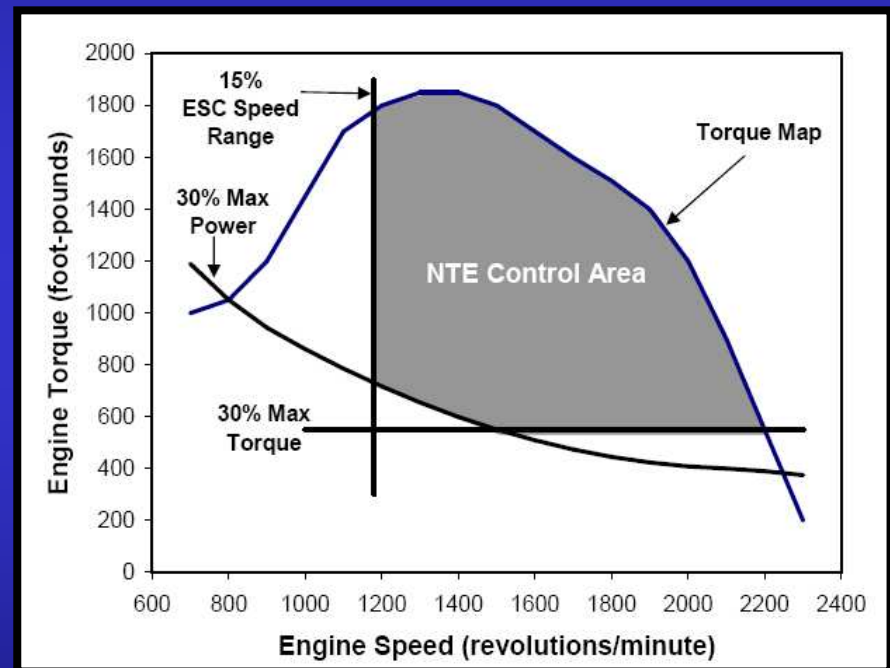


HDDE Emission Standards



Introduction of NTE Test

- **Required for certification**
 - **Started 1999 in SA**
 - **By Oct. 2002, elimination of off-cycle emissions**
 - **2005 MY for all engines**
- **Not a cycle but area of engine operation**
- **Allows real-world in-use testing on chassis**



Keeping In-Use Engines Clean

In-Use Compliance Testing



Sensor's Semtech-D

- **Detects bad designs and durability issues**
- **NTE compliance**
- **Over-the-road testing with PEMS**
- **Real-world conditions**
- **Identical to federal program**



In-Use Compliance Testing

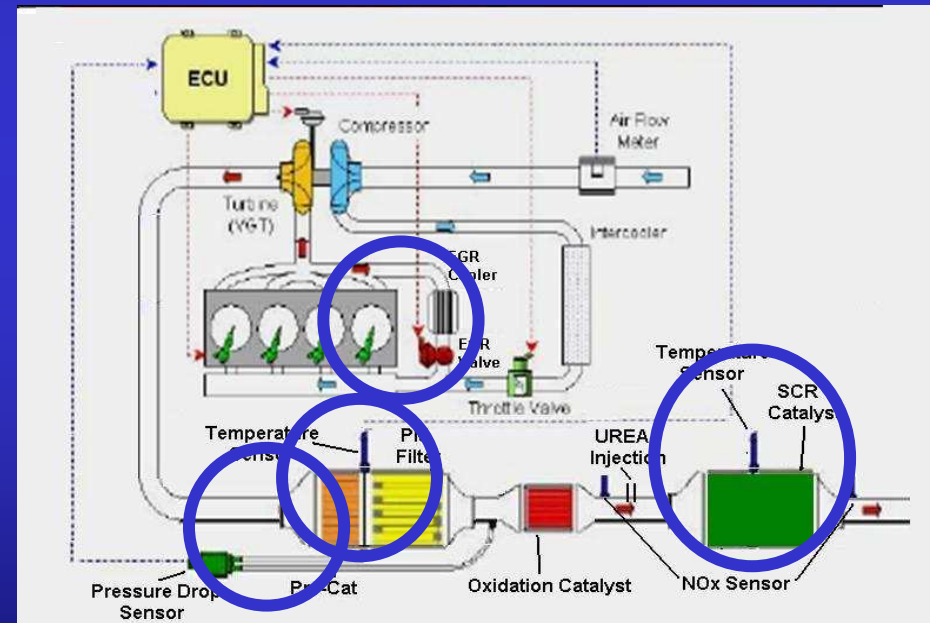
- **ARB/EPA select engine families**
- **Manufacturers screen, procure, and test HDDEs**
- **Up to 25% of EFs tested annually**
- **Testing conducted in two phases**
- **Emissions compared with vehicle pass criteria for pass or fail**
- **Manufacturers subject to remedial action**



Keeping In-Use Engines Clean

HD On-Board Diagnostics

- **Detects emission related failures**
- **EMD in 2007**
 - **Basic system**
 - **Not tied to emission levels**
- **OBD phased-in 2010 to 2016**
 - **Comprehensive**
 - **Uses sensor information to judge performance of emission controls**



HD On-Board Diagnostics

- **Threshold monitoring**
 - Warning light when emissions increase by a certain percentage
 - 8-10 checks per engine, e.g., PM filter, EGR, NOx catalyst, fuel system
- **Non-threshold monitoring**
 - Functional, rational, electrical
 - 75-100 checks per engine
- **OBD testing and validation**



Conclusion

- **Clean new engines through stringent emission standards**
- **Off-cycle emissions controlled with NTE requirements**
- **Low engine emissions sustained on the road through in-use compliance and OBD**

